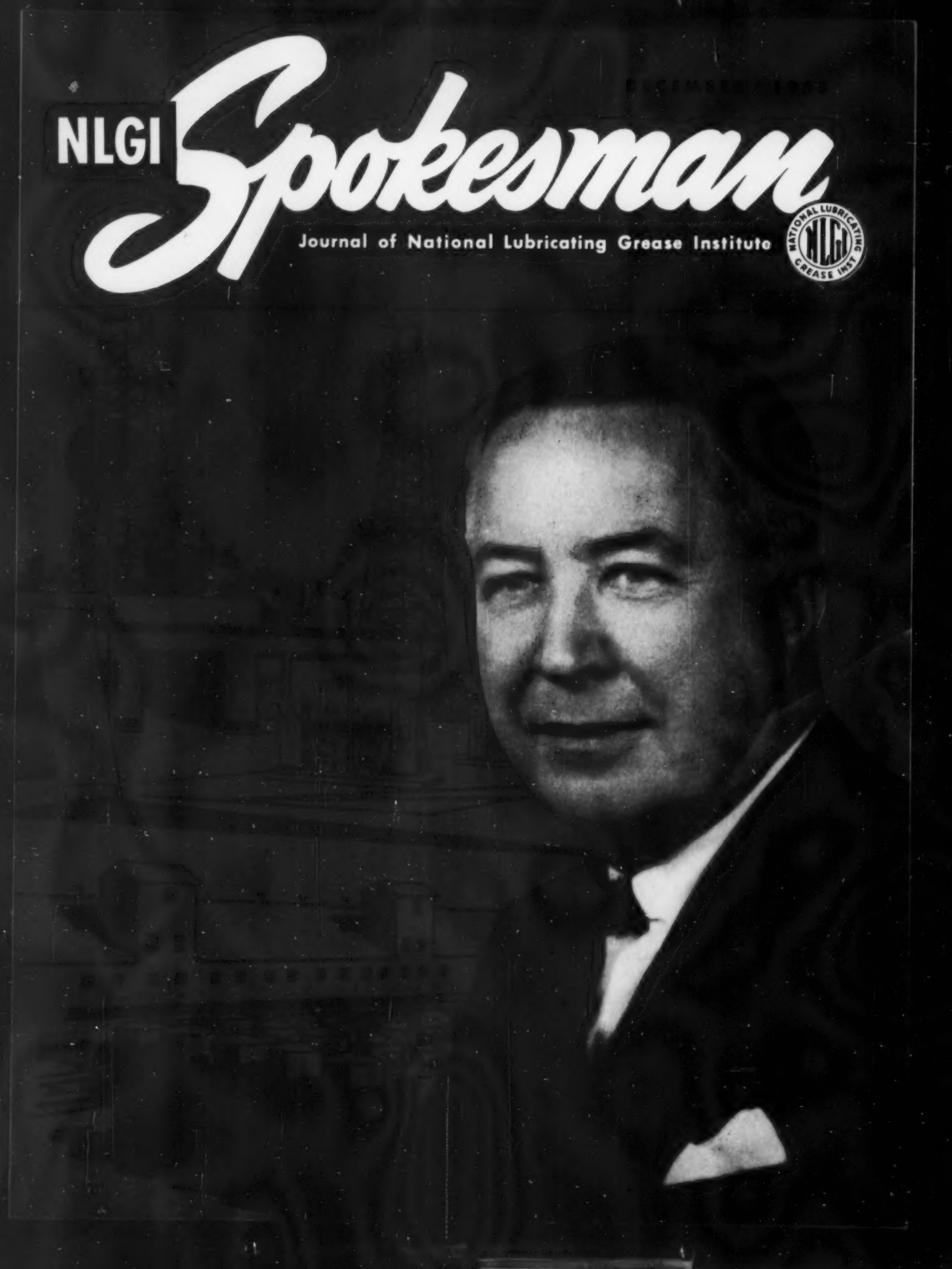
NLGI Spokesman

Journal of National Lubricating Grease Institute

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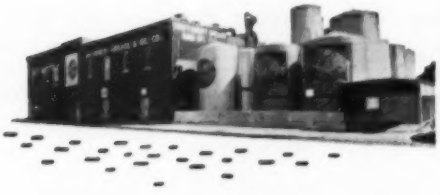

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President's page

by W. M. MURRAY, President, N L G I

A Look Backward at the Future

The 23rd annual meeting of the Institute is now a matter of record and it becomes my humble privilege to congratulate you all on its accomplishment.

How proper that the program just concluded pointed so clearly at research and experience as the foundation for product development.

Cycles come and cycles go.

We pass through an era of engineering requirements specifically defining products for special use, then through a consolidation-of-specification period that results in a multi-service product, thence into the realization that technological progress will complete the cycle and single use standards will be upon us. It behooves us of the Institute to pace ourselves in the lab, and in the plant, so that what lies ahead is ours "today."

For example, with jet injection engines, turbine engines, liquid petroleum fueled engines more than "on the drawing board" but rather "on the testing ground"—we have one path defined. Are we ready to meet the demand for the specific requirements just these few coming developments will require— and meet them far beyond the expectations of the design engineers?

This is what I mean by a look backward to the future.

The phenomenal program of the Institute stems basically from service to the lubricating grease Industry. Full scale cooperation at every turn permits a full realization of what healthy competition within the industry can mean to all of us. Certainly, it does not retard, it builds.

At Chicago, we placed a fine block in the continuous building plan. May I be capable of achieving the masonry that my predecessors accomplished. All of your assistance is needed. Let's get on with it, shall we?

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ABOUT THE COVER

NLGI's NEW PRESIDENT

William M. Murray, president of the National Lubricating Grease Institute, is an active member who has been prominent in oil circles throughout the country for many years. He has served the N.L.G.I. as director, vice-president, and is a member of the general committee division of marketing of the American Petroleum Institute.

From his position as vice president of Deep Rock Oil Company, Oklahoma City, he supervises the bulk sales of that company's refined products, lubricating oils, waxes, naphthas, fuels and specialties, in domestic and foreign markets. As a veteran of thirty-four years in the oil industry, he has conducted business with compounders, refiners and marketers throughout his entire business career.

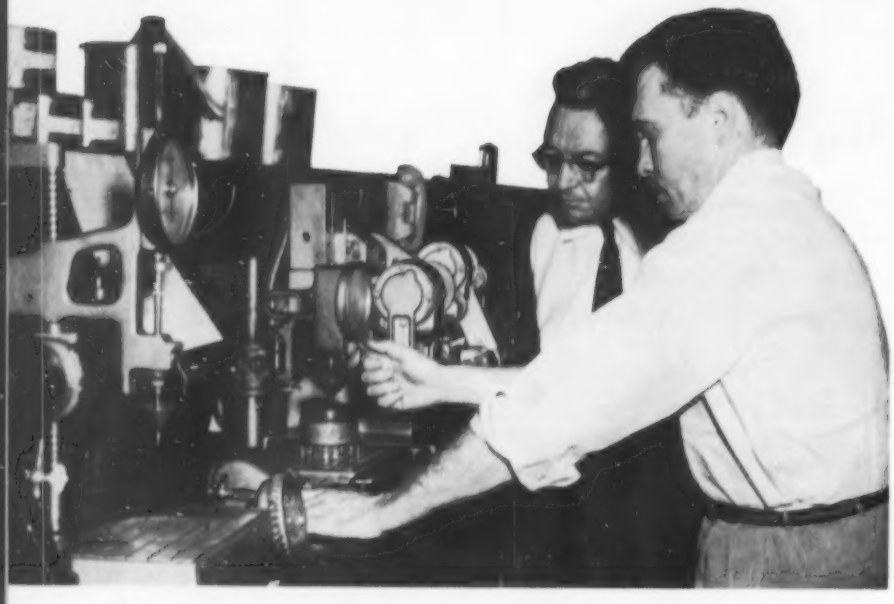
Born in Columbiana County, Ohio, Murray's early life was spent in Pennsylvania. He attended Carnegie Institute of Technology and the Art Institute of Chicago. While there, he was indoctrinated into the oil

Continued on page 28

Correlation of A Worker

By E. M. HIGGINS

Master Lubricants Company



Author E. M. Higgins, left, observing results of million stroke Worker Test.

The ASTM Grease Worker is a most valuable instrument for the control of grease consistency by grease manufacturers. It is also rated highly by grease users as part of their quality control tests. Inter-laboratory correlation is good where the prescribed test preparatory techniques are closely followed.

A prediction of consistency changes by the ASTM worker employing 100,000 strokes is of real assistance in determining possible grease consistency reactions should a housing be overfilled. If the grease breaks down bady or aerates in this test it is a rather definite indication that it will thin undesirably in the field under such operating conditions. This provides the Grease Worker's greatest benefits outside of its duties for laboratory control of production batches. Exceptions have been noted where greases thin out badly in the worker but become very hard in a bearing.

The ASTM worker is of very little worth in predicting consistency performance in a wide variety of bearing applications. Any laboratory test is of value only when it is possible to appraise accurately the phenomena being observed, so that the results of such tests can apply to the prediction of field performance with as little deviation as possible. The few relationships between laboratory tests and field performance that do hold are more flexible than ironclad, and based on past experience, prediction is tricky and can be in error. Some greases thicken in the worker while some thin out considerably. These reactions do not necessarily repeat in a bearing.

Substantial errors can occur even in functional testing equipment where field operating variables that are overlooked or impossible to apply have not been factored into the operation. In each situation the first significant point is to determine what the basic service function is and how it can be related to performance in different devices.

We all know that greases are highly complex colloidal systems and that some structural changes can take place from one batch to another in spite of excellent control and production techniques. Possibly this explains why some consider grease manufacture a science while others still continue to regard it as an art. Process control is naturally of great importance in maintaining product consistency; but undiscovered variations in basic raw materials can have a marked effect on eventual performance. Possible future consistency changes will not be revealed by the short-lived ASTM worker tests in these cases.

While the ASTM worker helps provide an indication of immediate structural or consistency changes it is entirely unsuited for predicting the eventual consistency

A.S.T.M. Grease Tests . . . with Field Performance

Presented as part of an ASTM Symposium, Technical Committee G, held in Houston, Texas, February 16, 1955. This paper was part of the second section devoted to the subject of "Correlations of Laboratory Tests with Simulated and Field Service."

changes which can take place during prolonged service. This appears to be a major drawback. The rate of penetration recovery if it occurs, and it usually does, also cannot be predicted. Apparently only time can reveal the final equilibrium consistency of a grease that develops as the lubricant first escapes from the contact areas of a bearing, becomes static on the retainers and in the closures on both sides of the bearing, and then slowly returns to the working areas if the grease is functioning correctly.

During the consistency phase changes of a grease, the penetration may go considerably below its original "as received" value, neglecting the influence of oxidation. Some thickening may be attributed to the physical separation and eventual leakage of oil from the system that readjusts the soap-to-oil ratio. If caused by oil separation, the worker cannot predict a change, since oil components of the grease are confined within the worker and are constantly mixed. There is no chance for particle agglomeration and therefore, a discrepancy exists in the relationship of worker data to hardening or tightening tendencies in service where oil can escape from the grease.

If the prime object in making grease worker tests is to search for suitable operating consistencies in bearings, then we must introduce test factors to account for bearing types, housing design and operating service conditions to which the grease may be assigned.

The lubrication requirements and range of mechanical

E. M. Higgins, left, observing field results in railway journal roller bearing.

forces observed in bearings today vary as widely as the services in which they are employed. With the involvement of well over 5000 sizes and types of antifriction bearings alone, it would take an instrument of infinite wisdom to predict accurately the consistency behavior of grease under all these operating conditions. A partial list of bearing types and operating factors includes:

Single row, light, medium and heavy series ball bearings.
Double row ball bearings with fixed or self-aligning features.
Many varieties of thrust type ball bearings.
Pre-lubricated single and double width shielded or sealed bearings.
Cylindrical bearings.
Cone type bearings, single or double mounted.
Spherical bearings, single or double mounted.
Needle bearings.
Housing design.
Wide variety of sleeve bearings and their application.
Speeds, temperatures and atmospheres.
Shock loads or vibration.
Operating position of equipment, horizontal or vertical.
Lubricant application techniques.

Grease development engineers must try to pin point the end use of the product they are formulating. The consistency suitable for one type of bearing and service might be useless in another. Most high speed, grease lubricated bearings require a channeling type grease; whereas, a low speed, heavy duty, roller bearing usually must employ much softer grease lubricants or oil. Many times consistency changes are a function of speed.

The standards for the proper consistency must be found by field testing. It is then the valuable function of the ASTM worker to assist in maintaining those standards during future production of the approved material.

For purposes of general performance research work, 100,000 or even a million strokes can be applied at various temperatures to obtain data. This can increase the value of the ASTM worker and might detect undesirable slumping or hardening tendencies. However, while a million strokes might sound impressive it should be kept in mind that this number of cycles would be obtained in a few hours in a bearing operating at 3600 rpm or in a railway journal roller bearing in two or three days.

If we compare the churning action of grease in a bearing to that in the grease worker it is immediately realized that the laboratory device is incapable of reproducing a single bearing action. It is interesting to note that the electron miscroscope shows almost no changes in the original soap structure after 100,000 strokes; thus, the worker does not even approach reproduction of the structural changes usually noted in a "used" grease.

In the average, properly filled housing most of the grease is immediately found lying against both sides of the balls or rollers. A small amount of grease and/or oil feeds into the rolling elements, thus providing satisfactory lubrication. The worker cannot predict whether or not the grease will act in this manner and to what degree.

The ASTM worker has provided indifferent results in shear tests with semifluid greases where the required worked consistency range is 340-370. Let us consider some attempts to apply the grease worker in this range.

In one case, a lithium grease having a worked penetration of 329 and a value of 352 after 10,000 strokes was used in railway, freight car, journal roller bearings. Shortly after being applied to car journals and placed in operation, the material thinned out badly, causing major leakage. Consistency could be determined only with a Mobilometer. If it were possible to convert the value to the conventional penetration scale, the reading would have been well over 500.

In a similar problem, a soda soap grease with a penetration of 350 had a value of 390 after applying 100,000 strokes. This grease also thinned out, but to a lesser degree, than the lithium grease in freight car service; but undesirable leakage was again experienced. The consistency of the lubricant in the bearing housing increased to over 425.

It is interesting to note that both these greases maintained a suitable consistency in conventional passenger car housing designs operating under zero pressure but were unsatisfactory when used in the freight car journal roller bearings employing axle rubbing seals made of rubber. The question later developed as to whether or not too much grease had been applied. Experimentally it has been found that the pressure inside these journal boxes reached as high as 6 psi. Pressure is normally relieved at 7 psi by the one-way breather, with occasional operation under vacuum.

One can readily realize that there is a vast difference in the treatment of grease in a grease worker compared to that in a railway journal roller bearing assembly where the lubricant is confined and operating under pressure and subjected to rolling action of the rollers under heavy load, plus heavy shock and lateral loads. In such a situation the ASTM worker has failed badly. Tests made with the Navy Worker more nearly checked with the field performance data collected for this work. The AAR tests call for 60 and 100,000 stroke tests with the grease to remain within certain consistency limits. It now appears that the modified specifications will depend on the consistency of the grease after field working in the bearing, with the ASTM grease worker more or less ignored. This problem then resolves itself into determining from what areas of the housing and bearing the specimens for penetration tests should be taken.

Conclusion

The ASTM grease worker offers some assistance in determining grease consistency changes under various conditions, but like other laboratory tests it is incapable of simulating the many existing conditions present in the over-all picture of bearing operation. Of course, it will always be a valuable asset in a grease laboratory. But it does seem that the ASTM grease worker has been extended beyond its capabilities because of the lack of other suitable equipment; therefore, new testing devices must be made available to the experimenter.

Acknowledgment

The author wishes to thank Mr. A. E. Baker of the General Electric Company Thomson Laboratory for his helpful comments in the review of this paper.

Correlation of Laboratory Tests With the Stability of Greases *in Freight Car Roller Bearings*

By J. M. Musselman

The Standard Oil Company (Ohio)

Presented as part of an ASTM Symposium, Technical Committee G, held in Houston, Texas, February 16, 1955. This paper was part of the second section devoted to the subject of "Correlations of Laboratory Tests with Simulated and Field Service."

ABSTRACT

The mechanical stability of four non-soap base greases and one soda base grease was measured with an ASTM Worker, a Shell Roll Worker and a test installation of a freight car roller bearing. No correlation was found between the standard laboratory tests and the roller bearing. A need exists for a laboratory test that will predict mechanical stability of greases in heavy duty roller bearing applications.

Authors S. R. Calish, left, and J. M. Stokely, right in the Richmond laboratory.

Correlation of Laboratory Tests with Field Observations of Grease Fluidity

Presented as part of an ASTM Symposium, Technical Committee G, held in Houston, Texas, February 16, 1955. This paper was part of the second section devoted to the subject of "Correlations of Laboratory Tests with Simulated and Field Service."

By J. M. Stokely and S. R. Calish

California Research Corporation

A number of service conditions tend to produce either temporary excessive fluidity or permanent loss of structure in lubricating greases. When such fluidity is observed in service, it is generally regarded as evidence of lack of shear stability. The conclusion is often reached that the solution to such a problem is to use a grease which has the best possible stability in the ASTM Grease Worker or the Shell Roll Test. In many cases, however, the use of such a grease does not solve the problem. Therefore, a great deal of research has been conducted on this subject.

Excessive fluidity is observed in automotive service under the following conditions:

1. Normally packed wheel hubs of city transit buses or heavy duty trucks in city traffic.
2. Overpacked wheel bearing hubs.
3. Water contamination such as in military vehicles, in wet logging, boat trailers, and rice farming.
4. Mixing of incompatible wheel bearing greases.

In industrial service excessive fluidity is frequently observed under these conditions:

1. Overfilling of antifriction bearing housings.
2. Water contamination.
3. Mixing of incompatible greases.
4. Long line dispensing systems under continuous pressure.

Excessive Grease Fluidity in Automotive Service

In the automotive field the excessive fluidity which may occur in hubs of city transit buses and heavily loaded trucks does not correlate either with the ASTM Grease Worker Test or the Roll Test. Examples of this are shown in Figures 1 and 2. Figure 1 shows a lithium base grease which became fluid in the hubs during operation both in heavy duty trucks in dense traffic and in city transit bus service. Figure 2 shows a sodium base grease which became fluid in less than 1000 miles in city

traffic. These examples are typical of a number of cases encountered in test vehicles in which the wheel hubs were underpacked by one-quarter to one-half inch below the bearing cups in order to minimize fluidity associated with overpacking of hubs.

Table I shows four typical wheel bearing greases listed in order of decreasing tendency to become fluid in wheel bearing hubs. The initial ASTM unworked penetration, the penetration after 100,000 strokes, and the worked penetration after four hours in the Roll Test are included for comparison. The first lithium base grease, which was

TABLE I

Laboratory Shear Stability of Wheel Bearing Greases Versus Fluidity in Hubs in Heavy Traffic

	ASTM Penetration			
Grease Type	*Unworked*	*After 100,000 Strokes in ASTM Grease Worker*	*After 4 Hours in Shell Roll Test*	*Resistance to Fluidization in Hubs*
Lithium Base	295	330	290	Low
Lithium Base	250	430	430+	Moderate
Sodium, NLGI No. 2 Grade	240	430+	430+	Good
Sodium, NLGI No. 3 Grade	200	370	340	Very Good

stable even after 1000 hours in the Roll Test, readily became fluid in wheel hubs. Other soft, buttery, multipurpose greases had a similar tendency, but to a lesser degree. The conventional sodium base greases with stiffer unworked consistencies and coarser fiber structures were more resistant to fluidization in the hub, but tended to dry out and harden under these severe conditions.

Electron micrographs (Figures 3 and 4) of two different lithium base greases, both of which had become fluid in the hubs of city transit buses, show a distinctive change in fiber structure. The micrographs at the left in each figure show the original fiber structures, and the pictures at the right show the used samples. In both cases, the used, semifluid sample shows an apparent swelling and agglomeration of soap fibers. This is quite different from the characteristic fragment of fibers which are observed in grease samples taken from the immediate vicinity of the rollers themselves. A possible explanation of this type of loss of grease structure is that the very high temperatures produced by constant braking in heavy traffic cause the grease to soften to the point where it becomes semifluid, and it then drops down from the top of the hub at trafffic stops. This constant tumbling at high temperature does not shear the fibers but may cause the physical changes shown in the electron micrographs. A number of such samples of lithium base greases have been examined in the electron microscope and all show this typical agglomeration of soap.

Temporary excessive fluidity caused by overpacking the hubs may occur with any wheel bearing grease. An overpacked hub prevents the bearing from clearing itself of excess grease. This grease churns in the bearing with resulting temporary softening until centrifugal force pushes the semifluid grease out through the seal on the

Figure 1. Left: Lithium hydroxystearate grease fluid in front wheel hubs of heavy duty truck in city traffic.

Figure 2. Filled sodium grease fluid in front wheel hubs of heavy duty truck in city traffic.

Figure 3. Lithium hydroxystearate grease. Left: original structure. Right: Swollen and agglomerated fibers from wheel hub.

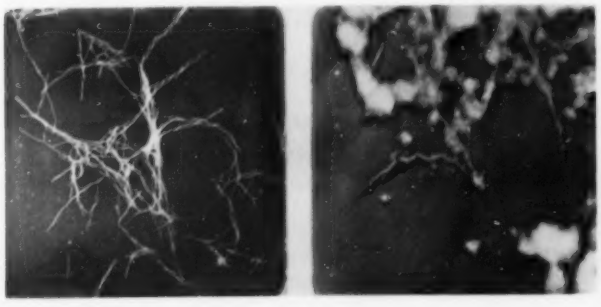
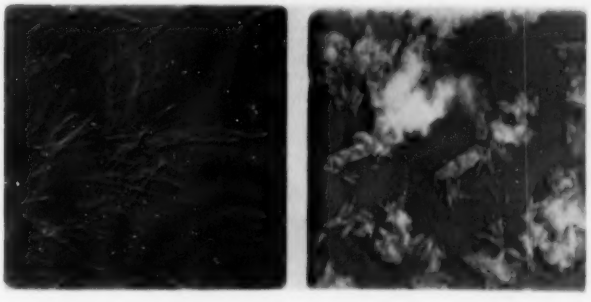


Figure 4. Lithium calcium grease. Left: Original structure. Right: Swollen and agglomerated fibers from wheel hub.



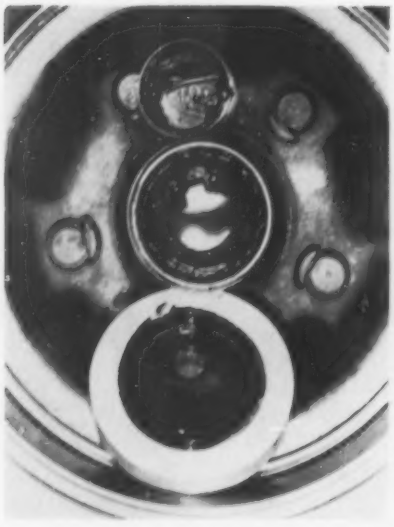


Figure 5. Lithium grease leakage due to overpacking wheel hubs.

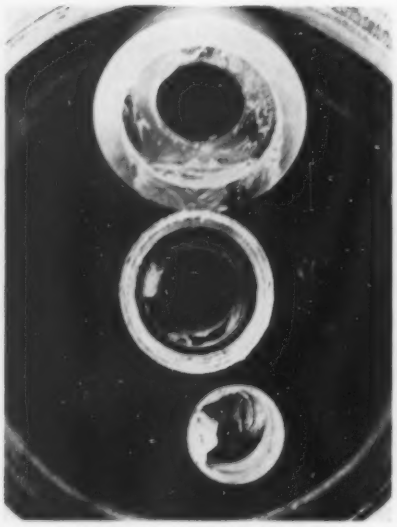


Figure 6. Filled sodium grease leakage due to overpacking wheel hubs.

Figure 7. No. 2 grade sodium grease leakage due to overpacking wheel hubs.

inside or into the hub cap on the outside. This grease may then return to its original consistency. This throwout of excess grease is shown by Figures 5, 6, and 7. These pictures show truck front wheel assemblies which have been modified so that a leakage cup, similar to the one in the ASTM Grease Leakage Tester, catches all the grease which escapes past the seal. The grease throwout shown was caused by overpacking by a measured amount, in this case one-quarter inch above the bearing cups, followed by a normal cycle of trucking operation for 18 hours with temperatures not exceeding 240° F, as measured by a thermocouple under the bearing cup. Figure 5 shows a lithium base, multipurpose-type grease; Figure 6, a filled sodium base grease; and Figure 7, a conventional sodium base wheel bearing grease of NLGI No. 2 grade. It is evident that substantial leakage past the seals into the leakage cup occurred with all three types of greases.

Water contamination can occur either in automotive or industrial service. Many greases will absorb water until a serious loss of grease structure occurs. The basic problem is the same for both automotive and industrial greases. Examples of water contamination are given below in the industrial section of this paper.

Mixing of incompatible greases in wheel bearings in the field continues to be an occasional problem. In many cases a low melting calcium grease is one of the materials involved. Figure 8 shows the results of an ASTM Grease Leakage Test operated at 180° F for 80 minutes with a mixture of half commercial calcium wheel bearing grease and half commercial sodium wheel bearing grease. Neither the calcium grease alone nor the sodium base grease alone showed slumping under these conditions, but the mixture was fluid, as shown.

Excessive Grease Fluidity in Industrial Service

Overfilling of antifriction bearings and housings is the most frequent cause of excessive fluidity in the industrial grease field. In many cases, bearings and housings which were designed for periodic hand-packing have been equipped with grease fittings or are supplied from central lubricating systems. If adequate vents for excess grease are not provided, the bearings cannot clear themselves when overfilled, and churning of the grease results. The stability of greases under these conditions appears to correlate at least directionally with the ASTM Grease Worker Test (100,000 strokes) and the Roll Test. Figure 9 shows a loaded, antifriction bearing which has a simple labyrinth seal on the housing and which is lubricated with a hand gun until the cavity is full of grease. This bearing is then run overnight without added heat, and the temperature of the grease does not exceed 150° F. The grease which leaks out of the bearing through three relief holes in the labyrinth seals is placed in a glass cylinder to determine the volume of loss prior to disassembly. It is not unusual for the grease to pour out of the housing when the bearing is disassembled, as shown in the picture, even though it may have a dropping point well above 350° F. The ability of various greases to resist this type of overfilling varies directionally with their work stability, but the differences are not as great as would be predicted from the simpler work stability tests, such as the ASTM Grease Worker or Roll Tests.

Excessive water contamination is common in canning equipment and in steel mill, roll-neck bearings. Figure 10 shows two water resistant greases which were employed in a can closing machine. The calcium base grease on the left absorbed a considerable amount of water and became semifluid, while the lithium base grease on the right did not emulsify. Figure 11 shows a lithium base extreme pressure grease which became contaminated with water in a steel mill, roll-neck bearing. When the bearing cover was removed, the grease flowed out of the bearing cavity, as shown.

The water resistance test of the MIL-G-10924 Automotive and Artillery Grease Specification, in which the shear stability of greases in the presence of 10% water is determined using the ASTM Worker, has been used to rate greases for water resistance. This test is not adequate

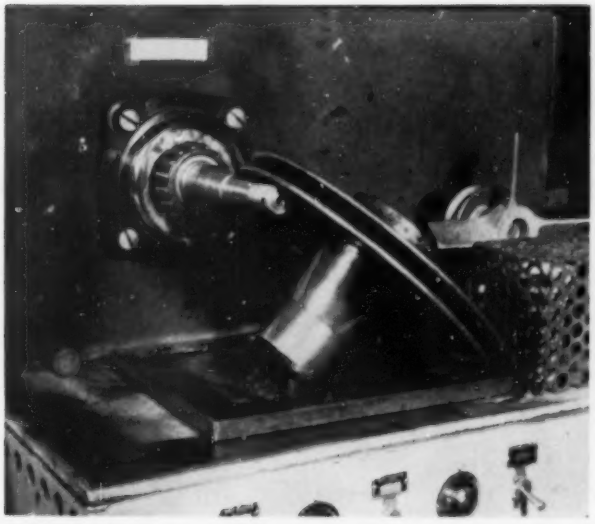


Figure 8. Above: 50:50 mixture of sodium and calcium wheel bearing greases.

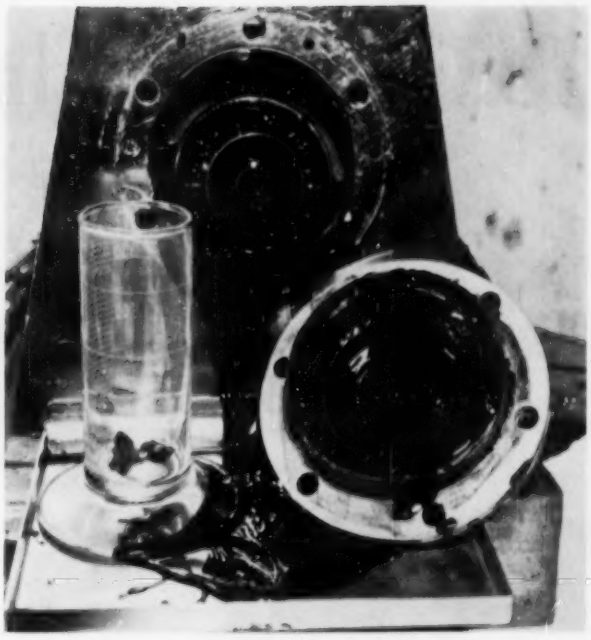


Figure 9. Right: Lithium extreme pressure grease leakage from overfilled antifriction bearing.

for predicting mechanical stability of water-contaminated greases in industrial service. For example, many sodium greases retain their consistency in this test, but emulsify and soften excessively in industrial services involving severe exposure to water.

Mixing of industrial greases is a common problem because of the difficulties of cleaning out grease dispensing systems. Whenever a change is made from one grease to another, either deliberately or accidentally, the possibility exists of serious incompatibility of the greases, which lowers both the melting point and the work stability of the mixture below those of either of the unmixed products. In a paper now in preparation, a number of examples of observed incompatibility of commercial grease will be cited, and methods for predicting incompatibility from simple laboratory tests will be discussed.

Centralized grease dispensing systems which are maintained under continuous pressure are reported to deliver excessively fluid grease at times. Here the problem appears to be one of bleeding and separation under pressure, however, rather than lack of shear stability.

Conclusions

Excessive fluidity in service is usually attributed to lack of work stability, which should be predictable from widely used work stability tests, such as the ASTM Grease Worker or the Roll Test. However, greases with exceptionally high work stability, as measured by these tests, have been observed to become excessively fluid in at least three of the four general conditions which are conducive to excessive fluidity in service.

1. Heat softening plus churning or tumbling in wheel hubs.
2. Overfilling of antifriction bearing housings, including wheel bearing hubs.
3. Excessive water contamination.
4. Mixing of incompatible greases.

On the other hand, a number of commercial greases which are not particularly shear stable, as measured by the ASTM Worker Test at 100,000 strokes or the Roll Test, retain their grease structure under these same conditions.

It is apparent that these simple laboratory tests are not adequate for predicting service performance, and much work remains to be done in the development of tests which will truly predict service performance.

FIGURE 10

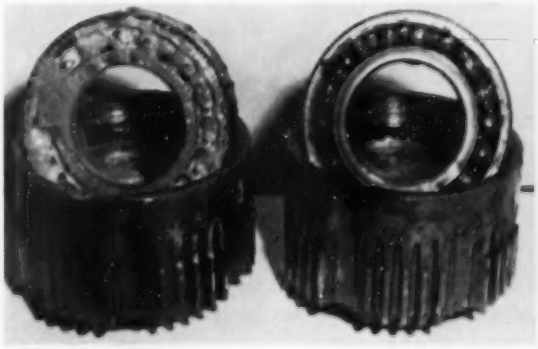


Figure 10. Effect of water contamination in can closing machine. Left: Calcium grease. Right: Lithium grease.

FIGURE 11

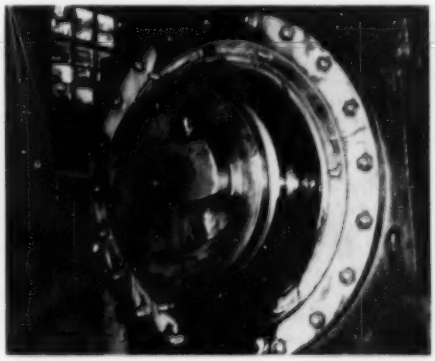


Figure 11. Lithium extreme pressure grease effect of water contamination in steel mill roll-neck bearings.

NLGI 23rd Annual Meeting

. . . a picture account of who was there,
what they did and said during the event,
October 31 to November 2 at
Chicago's Edgewater Beach Hotel . . .

Registration, kickoff for any meeting

ABOVE . . . NLGI President, H. L. Hemmingway gave opening address of welcome with sharply apt retort to accusations of inferior chassis lubricants. Entire address is on page 24.

UPPER RIGHT . . . Fred Bremier from Curtis Publishing. Told about farm markets for lubricants.

LOWER RIGHT . . . Major General Frank D. Merrill told audience, "You pay for good highways whether you have them or not."

Monday Afternoon Panel Discussion . . .

"LUBRICATING GREASES FOR MODERN FARM MACHINERY"

HERE'S THE PANEL

Left to right

C. J. Boner (standing)
J. W. Lane (partially hidden) was Chairman of session.
M. L. Carter, Panel Chairman
N. A. Sauter
O. L. Bandy
W. L. Bowers
D. O. Hull

Close up of three panel members

BANDY . . . "Endeavor to design better equipment for fast, efficient lubrication."

BOWERS . . . "In talking to a number of farmers I am often told that too much time is spent in greasing their equipment."

HULL . . . believed farm requirements for lubricants would not greatly increase—quality and suitability of lubricants would increase.

SYMPOSIUM . . . (left to right) N. Marusov (Chairman), H. Eyring, E. C. Forster, L. C. Brustrum, Ruth N. Weltmann, E. F. Koenig, L. C. Rotter and J. S. Aarons.

Tuesday Morning . . . Symposium—

"FLOW PROPERTIES of LUBRICATING GREASES"

Tuesday Morning (continued) SYMPOSIUM IN ACTION . . .

Dr. Henry Eyring, University of Utah . . . "critical review of basic principles of flow . . ."

J. S. Aarons, U. S. Steel . . . described need for laboratory evaluation of greases since development of centralized lubrication systems.

L. C. Brunstrum, described "Capillary Viscometry of Grease."

Ruth N. Weltmann . . . she presented methods of calculating pressure losses in pipe lines.

E. F. Koenig . . . "centralized lubrication systems are used almost universally . . ."

L. C. Rotter . . . "Originally industry was satisfied with a pump that would pump grease."

E. O. Forster . . . "It has been possible to establish the structure of the fiber network . . ."

Tuesday Afternoon . . . FOUR SPEAKERS

J. L. Dreher . . . "no one test . . . capable of predicting the bleeding rate . . ."

S. F. Calhoun . . . "compare presently used additives and develop new ones."

J. P. Dilworth . . . "performance of new soap-solid thickened synthetic oil grease."

John Y. McCollister . . . "marketing of a grease designed for corn pickers."

H. L. Hemmingway (left) receives President's Key from NLGI's 1954 President, G. A. Olsen. Presentation took place during annual banquet.

C. J. Boner beams on NLGI Annual Award just presented him by J. W. Lane, Chairman of Awards Committee. Mrs. Boner was fascinated with the silver tray. Seated is NLGI Treasurer, A. J. Daniel.

NLGI's First Honorary Members . . .

Holding his Honorary Membership certificate is M. R. Bower. That's Mrs. Bower with him. Interested audience in foreground is Mrs. H. L. Hemmingway whose husband is doing presenting.

H. L. Hemmingway congratulates and presents H. P. Hobart with his Honorary Membership certificate.

C. B. Karns receives his certificate with happy Mrs. Karns looking on.

Officers and Directors

NLGI Officers for 1956 are: President, W. M. Murray; Vice President, J. W. Lane, and Treasurer, A. J. Daniel.

Newly elected Directors during Annual Business Meeting are: H. P. Ferguson (left) and George Landis.

Directors: C. L. Johnson, R. Cubicciotti and H. A. Mayor, Jr.

Here are Directors: D. P. Clark, F. R. Hart and H. L. Hemmingway.

NLGI Active Members elected eight members to the Board of Directors. To the Left are six of them.

Audience during meeting shows C. W. Nofsinger and friends.

Directors F. E. Rosenstiehl and J. W. Lane during meeting.

Gordon Askins came from Sydney, Australia, liked meeting, joined NLGI.

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ADVANTAGES OF SHELL ALVANIA GREASE:

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3. **Shell Alvania Grease has extremely high oxidation stability.**
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Patents and Developments

Copper Corrosion—Inhibited Greases

While lithium base greases (of the type covered in U. S. patent 2,450,221) have proved eminently satisfactory in service, the increased use of copper and copper alloys in certain applications, particularly in aircraft and artillery control instruments, has introduced an additional problem of rendering the grease non-corrosive to copper in long time service. For this purpose, U. S. Army Specification 2-134 prescribes a rigorous copper corrosion test for qualification. In attempting to meet this specification, it has been found that corrosion inhibitors heretofore employed in greases are ineffective.

In U. S. Patent 2,690,998, the Texas Company discloses a satisfactorily inhibited lithium base grease containing 0.25-5% of an oil-soluble alkaline earth metal salt of an alkyl phenol compound selected from the group consisting of alkyl phenols having a total of 10-30 carbon atoms in the alkyl substituents on each benzene nucleus, and the corresponding alkyl phenol sulfides. Salts of this type have been suggested as detergent additives for mineral lubricating oils, but it is claimed entirely unexpected that they would function in such greases as copper corrosion inhibitors, since this action is completely remote from detergency.

The alkaline metal salts are prepared from alkyl phenols or the corresponding sulfides having the structural formula:

A suitable grease prepared in accordance with the patent has the following calculated composition:

	Weight per cent
Lithium soap of hydrogenated castor oil	12.7
Lithium stearate	4.4
Excess LiOH	0.2
Glycerine (from saponification of hydrogenated castor oil)	1.3
Paraffin base lubricating oil	19.7
Di-2-ethyl hexyl azelate	59.2
Phenyl alphanaphthylamine	0.5
"Acryloid HF-600"	2.0
Dye	0.0027

To this grease was added 0.4% of barium diamyl phenol sulfide, sold by Enjay Company as "Paranox 56." Addition of this material caused the above grease to pass the 2-134 copper corrosion test. Other suitable inhibitors claimed are basic barium cardanolate, magnesium C_{18}-C_{25} alkyl phenolate, etc.

Greases from Hydroxy Phenyl Fatty Acids

Lubricating greases prepared by thickening the lubricating oil with a metallic soap of a phenolic fatty acid have been found to have improved dropping points and a high degree of structural stability. According to the Standard Oil Development Company patent 2,692,232, these phenolic fatty acids contain a hydroxy group in the characteristic aryl structure and possess considerable advantages over the common grease-forming fatty acids. A typical acid is hydroxy-phenyl stearic acid, and directions for its preparation are given in the patent.

The following is an example of a grease prepared in accordance with the patent:

20 parts by weight of hydroxy phenyl stearic acid were charged to a grease kettle and 24 parts by weight of an acid-treated Mid-Continent distillate having a viscosity at 210° F. of about 50 S.U.S. were added thereto. The mixture was heated to about 150° F. There were then added 3 parts by weight of a 40% aqueous solution of sodium hydroxide. The temperature was then raised while stirring to 250° F. and held at that temperature until dehydration was complete. There were then added an additional 48 parts of the oil and the mass heated to 400° F. and then cooled. There resulted an excellent-appearing grease composition which had the following properties:

ASTM penetration 77° F. mm./10:	
Unworked penetration	210
Worked penetration (60 strokes)	230
Per cent free fatty acid as NaOH	0.3
Dropping point, °F	440+
Structural stability to mechanical working	Excellent
Penetration after 100,000 strokes in the ASTM worker	250

It is preferred to employ 3-10% by weight of lithium hydroxy phenyl stearic acid and 2-5% of the sodium salt of acetic acid which complexes with the hydroxy acid.

News Items

For use in lithium multipurpose greases, where consistency and stability are needed over varying temperatures and moisture conditions, Swift & Co., Hammond, Ind., now is making 12-hydroxystearic acid (Tech. Survey 9/3/55 P. 602).

Properties of stearic acid—Tillotson (Amer. Perfumer 8/55 P. 23).

General Electric now is selling Versilube G-300 silicone grease claimed to operate at 100° to 400° F. It is also making a tailor-made silicone polymer (F-50) (J. Comm. 9/22/55 P. 14).

The Hypregun light-weight, air-operated lubricating gun for field and plant maintenance, is said by Rockwell

Continued on page 43

President's Address

NLGI 23rd Annual Meeting

By H. L. HEMMINGWAY

At the San Francisco Meeting last year, Mr. H. R. Wolf of General Motors Corporation threw down the gauntlet to our industry on the alleged inadequacies of the products we manufacture. Again, at the S.A.E. Chassis Lubricant Symposium at Atlantic City in June, Mr. L. J. Kehoe, Jr. of General Motors said, "So far as I know, there is no generally distributed grease capable of complete and adequate lubrication of bushings, king pins or metallic joints." Later in the same paper he says, "We are at present trying some *experimental* greases which . . . seem to perform satisfactorily in dry weather for 800 to 1000 miles. The results with these greases indicate that . . . lubricants could be compounded that could give consistent results for at least 2500 miles."

Messrs. Wolf's and Kehoe's condemnation of chassis lubricants is not based on premature development of squeaks or rattles, but rather on the alleged *deterioration of the car's riding and handling qualities due to some change in the lubricant within* 20 *to* 200 *miles after lubrication.*

At the same June S.A.E. Meeting, Mr. J. B. Beltz of Oldsmobile Division, General Motors Corporation, described chassis grease retention tests in which several lubricating greases were evaluated on a severe road test in a passenger car especially built up with excessively high front end clearances so that grease loss would be accelerated and could be determined by front end rattle. Three chassis greases were evaluated. One, similar to that used in factory production, lasted 400 miles until the first rattle. One of the other two chassis greases gave 600 miles and the second gave 1000 miles of rattle-free service. It is believed that these latter two greases are the so-called "experimental" lubricating greases to which Mr. Kehoe made reference.

Various Reactions

The Wolf and Kehoe challenge to our industry has caused various reactions.

One reaction is that many of us have taken another look at chassis lubricant quality. There is little doubt that some products of questionable performance have found their way into the chassis lubrication. Some of us may have assumed that a chassis lubricant has to be "cheap" in order to sell, but that seems to be a short sighted, ridiculous argument. Suppose the cost of a real improvement was as high as 5c per pound of product. This amounts to an average cost increase of only 25c per passenger car per year!

Some, no doubt, have found it much easier to make a chassis lubricant that will zip through the dispensing equipment than to design a lubricant to stay put in moving parts of the car. The validity of this approach is now open to questions with the development of the N.L.G.I. procedure for matching lubricants and dispensing equipment.

On the other hand, most companies are featuring chassis lubricants of outstanding quality. The literature shows that many of us have developed our products after extensive retention tests in actual vehicles similar to those described by John Beltz. Even so, perhaps retention and "maintenance of the original ride and handling characteristics" are not synonomous. Since we in the lubricating grease industry have not had to develop the sensitivity in the seat of our pants to ride and handling characteristics, perhaps those experts in the automotive field will help us in our further development.

Some others have reacted to this challenge with resentment and the feeling that the criticism is unjust. In support of their position, if Messrs. Wolf and Kehoe have let their judgment be influenced by the quality of grease normally purchased for original lubrication of new cars, then they shouldn't expect good lubrication. The usual car manufacturer's specification does not assure a quality product. Ordinarily, a supplier cannot provide his top quality, branded chassis lubricant to this trade because he cannot compete price-wise. The usual manufacturer's specification calls for a product little better than a good quality cup grease and it is grossly unfair to condemn a chassis lubricant generally on the basis of its performance.

"Experimental" Greases Confused With Established Products

Proof of this is the fact that the two "experimental" greases tested by Oldsmobile gave from 50% to 150% longer life than the production grease. Mr. Kehoe underlines the fact that these greases were "experimental." The fact of the matter is that both *the products tested by Kehoe and Beltz were established branded lubricants, one of which had been on the market for ten years, and both representing product types which have been marketed for* 15 *to* 20 *years!* Perhaps they do not even represent the best that are available.

There are also those whose reaction to this challenge is to look to our merchandising. They ask whether we have failed to tell the story of the improvements we have made, and the importance of our product.

Only six years ago the most powerful car built in this country had 165 horsepower! In 1956 it will be almost

Continued on page 28

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METASAP* ALUMINUM STEARATES make specialty greases 6 WAYS BETTER

Whether you're making black oil greases or clear lubricants, you'll find the use of Metasap Aluminum Stearates will solve your manufacturing problems, cut costs, give you a better finished product. Check these Metasap grease bases for economical production of lubricants with any desired body:

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Samples are available for experimental work. Our research and technical staff will be glad to help you select the correct base for any given oil, or achieve any desired effect in a finished grease through use of proper soap mixtures.

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Products Development Laboratory
1 Market St.
West Warwick, Rhode Island

President's Address

Continued from page 24

impossible to get a new car so "low" in power. Five years ago only one or two makes of cars would do an honest 100 miles an hour. Today's new cars in nearly all makes and models are capable of 100 to 130 miles an hour. During this same period cars have become easier riding and easier to drive. The net is that for *comfort* and *safety* good lubrication today is more important than ever.

Biggest Bargains Inside an Automobile

Once in a while one of my friends complains of the high cost of lubrication. Actually, though, by comparison, lubrication is a real bargain. For example, I recall that in 1939 I took delivery on a new Oldsmobile for (believe it or not) $915, including a heater. While today's delivered prices for automobiles are more elusive, it appears that the full delivered price of the cheapest 1956 model of the same make, including heater and Hydra-Matic would be close to $2800.

To lubricate the 1939 car using the most expensive oil then available, with twice yearly seasonal changes of gear lubricant, and chassis lubrication plus oil changes about every 1000 miles for the national average mileage cost about $28.00 per year, or about 3% of the purchase price.

To lubricate the 1956 equivalent, using a 60c quart multi-grade oil, and for insurance of the high investment in machinery, changing the automatic transmission fluid once a year, and forcing lubricant into the rear axle once a year in spite of the absence of a drain hole, plus oil changes and chassis lubrication about every 1000 miles, the cost today is approximately $54.00, or a little less than 2% of the purchase price!

On that basis, lubrication of the car is a bigger bargain than the car itself. In fact, if the cost of lubrication had advanced as rapidly as the cost of the car, the best oil should sell for about $1.10 per quart, a pound of gear oil for 90c, and a chassis lube job should run from $2.30 to $3.00!

Will Owner's Stand on Their Heads?

Not all the car manufacturers have expressed dissatisfaction with lubricant quality, but there is a strong trend among all of them to stress that the car owner doesn't want to be bothered with the "inconvenience" of taking his car into a service station or car dealership for periodic lubrication. Hence the trend toward "push button" lubrication, elimination of lubrication fittings, etc.

One answer to this is that when the car manufacturers will guarantee that mufflers will never rust through, nuts and bolts under the car will never come loose, that owners will stand on their heads and carefully watch rear tire condition—in fact that nothing under the car will ever need periodic inspection—only then should they eliminate the "inconvenience" of the periodic lubrication AND INSPECTION that a car gets on the lift as part of any good lubrication job.

Two years ago a sheared cotter pin and loose nut was found on a tie rod of my own car during the course of a lubrication job. From that experience I have a definite preference for the "inconvenience" of periodic lubrication and inspection as opposed to the other kind of inconvenience that might result from a steering failure on the highway. With highway injuries and fatalities continuing at a fantastic rate, and with cars capable of higher speeds than ever before, now seems to be a poor time to gamble with highway safety, especially just to provide the sales feature of more convenience through the elimination of periodic lubrication and inspection.

Challenge Is Sales Advantage

As we look to the future, let's turn this challenge to our industry into a sales advantage. If the experts say that ride and handling deteriorate within 1000 miles after lubrication, what better ammunition could we want to sell "Lubricate for safety—and comfort—every 1000 miles." Lubrication is the biggest bargain of any automotive service operation. Its a bigger bargain than the car itself. Our lubricants today—including oils and gear oil as well as greases—are better than ever before, but they will be better tomorrow.

Your Institute has an international reputation for helping industry solve technical problems involving lubricating greases. May it now measure up to this latest challenge to the usefulness and integrity of our products.

About the Cover

Continued from page 7

industry by working part-time for C. B. Shaffer of Cushing Oil Field fame. It was at this job, that Murray first conceived the "Deep Rock" brand name, which was later to be the name adopted by the Shaffer Company.

During World War I, Murray was a Marine lieutenant, attached to forces in the Pacific area headquarters on Guam, with duties including aid to the Governor.

In 1921, he returned to Shaffer Oil and Refining Company, resigned to operate his own business for several years, then again returned to Shaffer as manager of the Lubricating Oil Sales department. He was later promoted to General Sales Manager of Lubricating Oils.

In 1930, the company's name was changed to Deep Rock Oil Refining Company, and after a later reorganization, to Deep Rock Oil Corporation. Murray was elected vice-president in 1953.

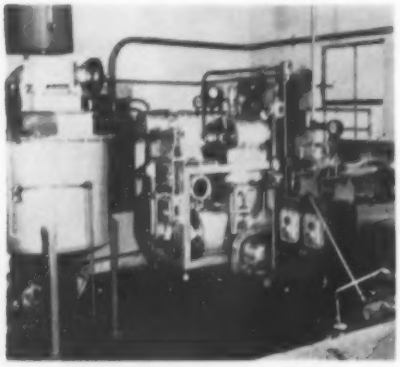
In April 1955, Kerr-McGee Oil Industries Incorporated acquired the Deep Rock name, and sales and refining facilities. It was at this time that the name was changed to the present name of Deep Rock Oil Company.

Murray was a member of the original lubrication committee of the A.P.I. and served in various capacities for that committee including a term as chairman.

He is a member of the Twenty-Five Year Club of the Petroleum Industry and of the Chicago Oil Men's Club. He is a silver card member of the Society of Automotive Engineers and has a long association with Western Petroleum Refiners Association. Murray is a member of the Tulsa Club, the Union League Club of Chicago, the Prairie Club of Chicago, American Legion, St. Andrews Society of Illinois, Chicago Museum of National History, the Art Institute of Chicago, and Damascus Lodge 888 AF & AM.

Murray married Miss Grace A. Murray in 1921. They have two daughters both married. Mr. and Mrs. Murray are members of the First Presbyterian Church of Tulsa. His hobbies include mineralogy, geology, and golf.

Industry NEWS



Lehigh Chemical Co. Announces New Grease-Making Unit

The Lehigh Chemical Company has announced the addition of a new grease-making unit which starts with raw material and goes to the finished product in one continuous operation.

Lehigh Chemical is the only company using this complete process machine which can produce up to 40,000 lbs. of grease per week, and requires only one operator, as compared to four or five operators needed for the old batch method which also took up five to ten times more floor space.

The original idea for this new machine was obtained from the Naval Research Laboratory. Lehigh then perfected the idea, and the machine was manufactured by Gridler Corp., Louisville, according to Lehigh specifications.

The complete process machine is extremely versatile, and can make any type grease. Products are well-controlled, with no variations.

Phoenix Chemical, an independent research laboratory, has stated complete satisfaction in the fine quality of the grease turned out by this new machine.

Stewart-Warner Establishes Four-Year Engineering Scholarships

Stewart-Warner Corporation recently announced establishment of four four-year engineering scholarships, three in mechanical engineering and one in electrical engineering, to be awarded to deserving high school graduates of exceptional ability through the National Merit Scholarship Corporation scholarship award program.

According to John M. Stalnaker, president of the National Merit Scholarship Corporation, the independent, non-profit corporation which has been set up with initial funds of $20.5 million to devise and administer a nation-wide system of scholarships for higher education, Stewart-Warner is the third organization to announce participation in the new program by establishing specific scholarships. Previous scholarship contributors have been Sears-Roebuck Foundation and Time Inc. Stewart-Warner's action will release matching funds from the working funds of National Merit Scholarship Corporation for four additional scholarships, Mr. Stalnaker said.

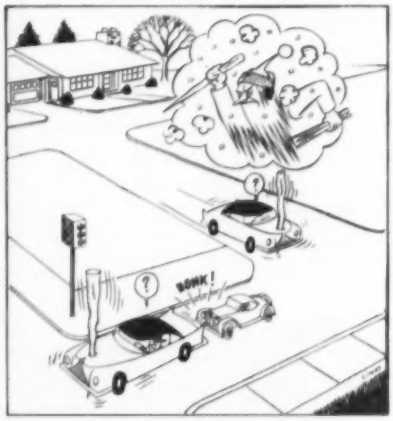
Effective immediately, the four Stewart-Warner Merit Scholarships will permit four young men from among the 60,000 highly selected senior students who took the recent nation-wide competitive tests at 10,800 high schools to enter the engineering schools of their choice next Fall.

New Products List Issued By Acheson Colloids

A newly revised 4-page booklet, listing 42 colloidal and semi-colloidal dispersions for operational functions, maintenance, lubrication, machine design, and other industrial applications, has just been issued by Acheson Colloids Co. These products include dispersions of graphite, molybdenum disulfide, mica, vermiculite, zinc oxide, and acetylene black. Carriers and diluents are given for each product, along with typical applications and important physical data.

New on the list is "dag" Dispersion No. 224, a mica-and-water product for use as a metalworking lubricant (particularly for extruding aluminum) and as a dielectric coating.

Copies of "A List of 'dag' Dispersions for Industry" are available free of charge and may be obtained by writing to Acheson Colloids Company, Division of Acheson Industries, Inc., Port Huron, Michigan.



Favorite Winter Stalls

Here is where most motorists will stall most frequently this winter. The cause is carburetor icing—responsible for stalling up to 55 per cent of cars on cold damp days, according to road tests at Gulf Oil Laboratories. On such mornings a frosty ice often forms inside the carburetor, blocking air passages at idling speed. Until the carburetor warms up, stops at intersections or in traffic can cause stalling. A remedy has been developed in anti-carburetor icing additives, which are now available in some premium gasolines.

Road Tests Establish Carburetor Icing as Chief Cause of Winter Stalling

Carburetor icing has been the chief cause of automobile stalling during cold, damp weather within recent years, Gulf Oil research laboratories have established.

The conclusion results from a comprehensive road test program in which over 100 cars of all makes, using representative gasolines, were driven in cool season weather conditions.

The tests further confirmed that anti-carburetor icing additives, at present used only in the premium brands of several leading refiners, successfully combat the problem.

"Conk-outs" due to carburetor ice are all too familiar to most motorists, although many do not recognize the cause. These stalls usually occur in the first mile of driving, most often when the motorist first stops, idling

his motor, at an intersection or in traffic.

The reason is that gasoline, when drawn into a cold carburetor, sucks heat from the air as it expands into vapor, exerting a refrigerating action on airborne moisture. This moisture falls on the throttle plate as a frosty ice, blocking air passages when the throttle is in idling position.

Result: Air is cut off at idling speed and the motor dies. The condition is gradually overcome, after one or many stalls, as the carburetor warms.

Under conditions most conducive to this happening, namely at temperatures from 35° F. to 45° F. and at humidities of 75 per cent upwards, the laboratories found that 55 per cent of all the cars tested stalled from carburetor icing when driven from a cold start.

Carburetor icing was shown to persist as a problem (although lesser at the outer limits) through the full temperature span from 30° F. to 55° F. and in humidities from 60 per cent upwards.

For instance, road testing in the 60 per cent to 70 per cent humidity range resulted in stalls of 29 per cent of all cars tested.

Weather favorable to carburetor icing is encountered during about 50 per cent of the days in late fall, winter and early spring in northern states. Since humidity is often high in early morning, carburetor icing is particularly frequent in morning starts.

Such icing is not a problem on very cold days because the amount of moisture in the air is insufficient to block carburetor air passages even though some frost is formed, the laboratories explained. It is of course not a problem in warm weather when carburetor warmth prevents the moisture from freezing.

In the Gulf tests, the drivers drove from a cold start, under selected conditions of temperature and humidity, making stops and permitting the motor to idle at predetermined points.

The tests were part of a program aimed at improving winter driving characteristics of automobile fuels.

Lithium Corp. Curtails Spodumene Mining

Lithium Corporation of America, Inc. plans to place its South Dakota mining operations on standby basis

early next year owing to surplus inventories of raw materials, it was announced recently by H. W. Rogers, President.

The company stated that the earlier short supply of spodumene, the lithium mineral, had been overcome by development of new sources and that adequate inventories of this raw material had built up to a level adequate for many months. Further production from its mines, therefore, is to be curtailed.

Formerly the main source of lithium minerals, the Black Hills area is now effected by competitive sources of supply which enjoy lower transport costs and assured facilities for consistent and predictable production. Water supply has been a particular problem in the Black Hills the past two years.

The Corporation extracts lithium from its ores and produces 25 chemical compounds which have found wide spread use in industry. Production of these chemical compounds is to be further increased.

The Corporation operates chemical manufacturing plants in St. Louis Park, Minnesota and Bessemer City, North Carolina.

The Right to Be Wrong

Roger M. Blough, chairman of U. S. Steel Corporation, declared that the trend toward government paternalism in assuming welfare responsibilities of the individual "appears to be slowing to a walk."

In a talk before the conference on American ideals at Baylor University, Mr. Blough pointed out that ". . . this encouraging trend doesn't mean that our nation has solved the age-old question of how much government is enough—and how much is too much. Nor does it mean that the government will relinquish all of its controls it now has over us.

"I doubt if the American people want that. Nor does it mean there will be no additional welfare laws. More will undoubtedly be added. But even so, the careful observer over the past few years can detect many signs that we are in a mood to listen to persons who are sponsoring that amazingly productive American ideal of individual freedom with personal responsibility."

The retreat from individual independence and responsibility, started some 50 years ago, was accelerated by World War I and brought into full force by the depression of the 1930's, Mr. Blough said. "Almost all of us—including many of our businessmen—rejected the free market and turned to the government to have our problems solved for us.

"In our confusion and despair, we honestly began to believe that government could provide us with the security we were so desperately seeking. We accepted the government's offer to protect us against our own mistakes. Laws were passed which forbade us to be wrong in vast areas of our personal lives and daily affairs. We were permitted to do only 'right'—or, at least, what persons in authority over us decreed to be right."

The fundamental privilege of all rights and freedoms in the American

way of life is the right to be wrong, Mr. Blough said. "If the enemies of freedom ever succeeded in depriving us of this right—or persuading us to give it up voluntarily—freedom itself will simultaneously disappear. When I speak of the right to be wrong I am, of course, referring to the actions of the peaceful person who has no desire to use violence upon his neighbor, or to defraud him, or to defame his good name or character."

Mr. Blough stressed that the country cannot have both guaranteed security and freedom of choice at the same time. He said he was not opposed to any specific law which is designed to "help unfortunate or improvident people; but rather it is the spirit and trend toward a dependence on government instead of ourselves which disturbs me."

Mr. Blough pointed out that throughout history when people have relied on personal responsibility and freedom, "they have been amazed at the fruitful productiveness which was unleashed." Using atomic energy as a current example of this, he said that "as important as atomic energy is for war-preventive purposes, this is dwarfed by its peaceful potential. Its power, harnessed and developed for peaceful industrial purposes can only be described as cataclysmic in its endless usefulness and service for not only Americans but all mankind."

Mr. Blough predicted "that the nation which most effectively utilizes atomic energy for peaceful uses is the nation which will most surely develop its potential for national safety in times of international conflict—if there should ever be such times."

General Mills' Dr. Brunetti Addresses Congressional Committee

Industry and labor unions should join forces to prepare for the changes that automation is bringing, Dr. Cledo Brunetti of General Mills, Inc., told the Congressional committee holding hearings on the effects of automation on the national economy.

He recommended a six-point course of action for preventing, or minimizing the "short-term dislocations which occur in industries where the workers were not prepared for the changes wrought by automation."

1. New jobs created by automation must be defined.

2. Industry and unions must jointly inform the worker of these new job opportunities.

3. The worker must be informed in advance that the initiative to obtain new basic skills must come from him.

4. Educational facilities must be expanded and reoriented to meet the new requirements.

5. Industry must train workers to operate the specific automatic machinery installed.

6. Procedures must be set up by industry to properly evaluate the new skills.

Dr. Brunetti, who is director of research and development for his firm's Mechanical Division, gave specific examples of the types and numbers of new jobs resulting from automation in the electronics industry. These included: automatic machine operators, electronic test operators, machine maintenance mechanics, electronic technicians, key-punch operators, computer programmers, instrument mechanics, electromechanical technicians, and many others.

Using the "Autofab" electronic assembly machine developed by General Mills as an example, he showed the Subcommittee on Economic Stabilization that, although fewer workers were needed for automatic assembly than for hand assembly, increased production because of the machine brings total employment up instead of down. In addition, it creates additional new jobs in the distribution and automation machine producing industries.

He drew parallels to the fears that had been expressed at the introduction of all labor-saving machinery in the past, pointing out that the end result has always been more production and more jobs.

The U. S. population is increasing at a faster rate than the labor force, Dr. Brunetti said, and automation is an absolute necessity if we are to maintain and improve our standard of living.

Today's competitive business conditions, he said, are forcing industry to seek new ways of cutting the costs of its products. This is resulting in more and better products at lower prices to the customer. Conversely, he cited examples of industries and even nations that have lost their entire markets through delay or lack of introducing cost-cutting equipment.

Fears that automation will result in

mass unemployment overnight are groundless, Dr. Brunetti stated. "It's a step by step evolution with a built-in governor," he added. "The long man-years of research required, the high cost of development, the role of the customer in ever-changing his tastes, and the long advanced planning required by management, act as a governor in installing automatic machinery. Over-mechanization is not good management—or even economical."

U. S. Steel's Fairless Describes American Farmer As Vital to Industry

Benjamin F. Fairless, Chairman of the Executive Advisory Committee of U. S. Steel Corporation, recently declared that the American farmer has a vital stake in the growth and prosperity of urban industry. Only a profitable industry, he said, can expand rapidly enough to absorb the excess manpower which is no longer necessary in agriculture because of the phenomenal technological advances in feeds, seeds, chemicals and farm machinery.

Speaking at the dedication of the new feed technology wing at Kansas State College, Mr. Fairless stressed the inter-dependence of agriculture and urban industry by pointing out that some 9½ million people had left the farm in the past 17 years to seek work in the cities. Had these people not been able to find jobs; and had they been forced to remain on the farm, he said, American agriculture would have suffered severely.

"A little simple arithmetic will reveal that per capita income in agriculture last year would have been only about two-thirds as large as it actually was," Mr. Fairless said. "Any time you lop off one-third of the present annual income of the average farm family, then agriculture will be a very sick industry indeed.

"Therefore I believe that the future prosperity of American agriculture depends primarily on the ability of urban enterprise to attract, absorb and support all the excess manpower that is no longer necessary on the farm. And the ability of American business to do that job depends entirely upon the rapidity with which it grows and expands.

"Growth, in turn, depends in very large degree upon the kind of climate you have; and just as the size of a farm crop is affected by the temperature, the rainfall and the length of the growing season, so the rapidity of business growth depends upon the economic and political climate in which we operate."

Reviewing some of the changes in the political climate since "The beginning of 1953 when a breath of Kansas weather moved into Washington," Mr. Fairless observed that, at the end of the Korean conflict when business began to slump, there was pressure from some quarters to provide a public works program which would give temporary employment to some 3 million persons at a cost of $15 billion a year.

"But," Mr. Fairless continued, "instead of following this outworn policy—which has never yet produced peacetime prosperity—the government began systematically to create the kind of climate that would stimulate the growth of the entire economy.

"Instead, of using $15 billion in federal funds, it encouraged American industry to spend nearly twice that sum, each year, on capital improvements and new facilities. Instead of providing 3 million temporary jobs on relief projects, it actually got some 4 million new and permanent jobs which were created entirely by private enterprise.

"That is a purely factual statement of some of the outstanding results of this recent change in the political climate. I realize, of course, that this change has been severely condemned in some quarters where the charge is made that it has benefited business. Well, I will not only admit that this charge is completely true, but I will go even further and tell you, quite honestly, that I don't know of any segment of our economy which has not been benefited, and which is not better off today than it would otherwise have been."

Emery Offers Two New Products

Two new Emery products, Emoleins 2957 and 2958 Lubricant Esters are now available on a commercial basis. During development they were known as Emery 3057-S and Emery 3058-S.

These lubricant esters are diesters of azelaic acid; 2957 the iso-octyl ester and 2958 the di-2-ethylhexyl ester.

The merits of these azelate esters for synthetic lubricant application have been clearly established during the past five years. High quality, competitively priced, compounded lubricants for military and civilian requirements can be confidently based on these Emolein Esters.

The major advantages of Emoleins 2957 and 2958 are:

1. Outstanding viscosity–temperature relationships
2. High viscosity indexes
3. Stable Low-Temperature viscosities
4. Excellent lubricity
5. Stability to oxidation and thermal conditions
6. Low sludging and coking
7. Excellent additive response
8. High flash and fire value; low evaporation
9. Excellent availability from domestic source materials.

Jones and Laughlin Constructs Supply Headquarters in Tulsa, Okla.

Ground was broken in Tulsa the afternoon of November 2nd at 2:30 p.m. for the construction of a new $1,500,000 headquarters building for the Supply Division of Jones & Laughlin Steel Corporation.

The new Supply Division building will be a modernistic brick structure containing more than 100,000 square feet of floor space. It will consist of an air-conditioned office and a large warehouse, with a file storage area in the basement.

The new structure is expected to be completed and ready for occupancy by the Supply Division's 300 Tulsa employes in September, 1956.

The building will have a 202-foot frontage facing west on Sheridan Road. It will extend 463 feet parallel to 15th Street. The air-conditioned office will have 47,500 square feet of space. A 50,000-square-foot warehouse and supply store will service the firm's customers in the Tulsa area.

A 6,000-square-foot dock area on the east will be serviced by a spur line of the Frisco Railway. At the rear of the building will be a pipe-storage area and an off-street parking lot for 240 cars.

The 11-acre site was purchased from Siegfried Industrial Sites, Inc., Tulsa. The building was designed by Black and West, Tulsa architects.

B. Brewster Jennings Announces Mobil Overseas Oil Company

A reorganization of the overseas operations of Socony Mobil Oil Company, Inc., will take place effective on January 1, with the establishment of a wholly owned affiliate, Mobil Overseas Oil Company, Inc., B. Brewster Jennings, chairman of the board of directors of Socony Mobil, announced.

The Mobil Overseas Oil Company will have assets in excess of $500,000,000 and will operate with a high degree of autonomy, Mr. Jennings said, in line with Socony Mobil's decentralization policy.

The overseas company will integrate and be responsible for all activities of Socony Mobil and its affiliates in the Eastern Hemisphere and Latin America except for its interest in Standard-Vacuum, interests within major Middle East concessionary areas, and producing operations within Venezuela, Colombia, and Peru.

Officers and directors of the Mobil Overseas Oil Company have all been chosen from senior members of the Socony Mobil group. President will be P. V. Keyser, Jr., who will continue as a director and vice president of Socony Mobil. Others will be: F. S. Cooper, Jr., director and vice president in charge of marketing; W. G. Corwin, director in charge of producing; A. V. Danner, director and vice president in charge of crude and wholesale sales; A. C. Ingraham, director and vice president in charge of supply and distribution; R. R. Jackson, director in charge of manufacturing; W. L. King, director and general counsel; F. E. Powell, Jr., director and vice president in charge of marine trade; J. H. B. Wellacott, director in charge of finance; A. L. Lanckton, secretary; E. J. Glocke, comptroller; F. L. White, treasurer.

Organization of the new company comes as a result of the rapid growth of Socony Mobil's overseas operations which has produced a corresponding growth in administrative and related problems. The Mobil Overseas Oil Company and its affiliates will have about 25,000 employees, and will have available to it in excess of 300,000 barrels per day of crude oil, and refinery capacity of about 220,000 barrels per day, a fleet of tankers, and marketing operations in Europe, North and West Africa, the Middle East, and Latin America.

Headquarters of the new company will be at 26 Broadway until next summer when they will be moved to the new Socony Mobil building at Lexington Avenue and 42nd Street, New York.

Continental Can Arranges Loan With Insurance Firms

Continental Can Company, Inc. has entered into an agreement with Metropolitan Life Insurance Company and New York Life Insurance Company under which the insurance companies will loan Continental $25,000,000 on 40-year 3¼% notes maturing November 1, 1995, according to an announcement made recently by Continental.

It was indicated that the proceeds from these notes will be used to provide additional working capital and to assist the company in meeting its capital needs for new facilities, improvements and expansion over the next five years.

OIIC Exhibits "Portraits In Oil" Artwork

The original art work used in the "Portraits In Oil" series prepared by the Oil Industry Information Committee of the American Petroleum Institute is now on exhibit in the Drake Well Memorial Museum in Titusville, Pa.

In addition, photographic reproductions of the drawing will be placed in the rooms of the Drake Hotel in the same community.

This was announced by OIIC Executive Director H. B. Miller, upon completion of the recent transfer of the art work to the shrine commemorating the drilling of the world's first commercial oil well in 1859.

The "Portraits In Oil" series was prepared originally for oil industry company publications, as a continuing tribute to the many pioneers who contributed much to the beginnings or growth of petroleum as an industry.

Among the pioneers honored were Col. Edwin L. Drake, Dr. Dixi Crosby, Benjamin Silliman, Samuel Kier, W. A. ("Uncle Billy") Smith, James Townsend, Columbus Marion ("Dad") Joiner, Capt. Anthony Lucas, Amos Densmore, John A. Mather, and many others.

Each "Portrait" consists of a hand-drawn likeness of the pioneer, and illustrated highlights of his career and contributions.

The "Portraits" were used by many oil industry company publications and hundreds of newspapers throughout the country. Because of their authenticity and historic flavor, the Drake Well Memorial Museum requested the OIIC's permission to hang the art work in the museum for permanent exhibition.

Lithium Corporation To Expand

Lithium Corporation of America, Inc. will expand its electrolytic plant at St. Louis Park, Minneapolis, Minnesota. H. W. Rogers, President of the Corporation, announces the company's present contractual requirements for the supply of lithium metal and lithium hydride in 1956 has made necessary the immediate expansion of the Metal Division to meet the demand.

PEOPLE in the Industry

WILSON SIMMONS

Southwest Grease & Oil Announces Wilson Simmons New Sales Representative

Wilson Simmons began his employment with Southwest Grease & Oil Co., Inc. as their new Northeastern territory salesman on October 3, 1955.

He brings with him a fine sales record of twenty-three years in the petroleum industry.

He resides at 6515 Valley Road, Kansas City, Mo.

Nopco Appoints New Laboratory Head

The Nopco Chemical Company has announced the appointment of Dr. Charles A. Fetscher as Director of its Industrial General Laboratory.

In his new position, Dr. Fetscher will be in charge of all research activities pertaining to the development of new products for Nopco's Industrial Division. These products include synthetic organic chemicals and industrial processing specialties for such diverse industries as the manufacture of paper, leather, textiles, paint, lubricants, cement, detergents, fertilizers, adhesives, and insecticides.

A graduate of Holy Cross College, Dr. Fetscher received his Ph.D. in organic chemistry from Columbia University. Before coming to Nopco, he was Head of Research for Cluett, Peabody & Co., Inc.

E. K. BALLARD

Deep Rock Oil Appoints Elmo K. Ballard

The appointment of Elmo K. Ballard as pipeline sales representative in the Chicago district of Deep Rock Oil Company was announced today by James J. Kelly, vice president.

Ballard transfers from a sales position with Kerr-McGee Oil Industries, Inc., with whom he has been associated since 1954. Immediately prior to the appointment with Deep Rock, he was on leave of absence to Valley States Oils, Inc., Memphis, Tennessee, heading that company's Chicago office.

Ballard's office will be located at 616 S. Michigan Avenue. In this new position he will handle the area bulk pipeline products produced and marketed by Deep Rock Oil Company.

Effective November 1, the offices of Valley States Oils, Inc., will be under the supervision of K. U. Herbert, 310 S. Michigan Avenue.

Ballard will continue to cooperate with and assist this affiliate company.

U. S. Steel Appoints R. C. Cooper Vice President

C. F. Hood, president United States Steel Corporation, announced the appointment of R. Conrad Cooper as vice president, administration planning, effective November 1. Mr. Cooper, who has served as vice president, industrial engineering, since 1948, will assist in the application of over-all programs and policies.

At the same time, Harvey B. Jordan, executive vice president, operations, announced the appointment of John E. Angle, presently general superintendent, Gary Sheet and Tin Mill, as vice president, industrial engineering, succeeding Mr. Cooper.

A native of Beaver Dam, Kentucky, Mr. Cooper was graduated from the University of Minnesota in 1926 with a bachelor of science degree. In the same year he began his career as a field engineer for Universal Portland Cement Company, Minneapolis. In 1929 he became a field engineer on consulting industrial engineering work in New York. From 1937 to 1945 Mr. Cooper was with Wheeling Steel Corporation, serving in several capacities including assistant vice president in charge of operations. He joined United States Steel in 1945 as assistant vice president, industrial relations. He is a member of the American Iron and Steel Institute and the Society for the Advancement of Management.

Mr. Angle, a native of Mansfield, Ohio, received the degree of bachelor of science from Lehigh University in 1932. He began his career at the Gary Sheet and Tin Mill of United States Steel that year as a junior metallurgist. Two years later he became turn foreman in the metallurgical group at the mill. In 1936 he became assistant superintendent of the mill's sheet division, and advanced to superintendent of the division in 1939. He was named assistant general superintendent in 1944 and in 1952 became general superintendent. Mr. Angle is a member of the American Iron and Steel Institute, the American Society for Metals and the Association of Iron and Steel Engineers. He has been active in a number of civic organizations in Gary, Indiana, including the public library, the Chamber of Commerce, the Safety Council, the Methodist Hospital board, the Gary Industrial Foundation and the Chicago Regional Planning Association.

New Division Manager Named by Shell Oil

Herbert S. Haight has been named manager of Shell Oil Company's San

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Baker's® METHYL HYDROXYSTEARATE

the superior source of hydroxystearic acid produces greases

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1. **LONGER LUBRICATION LIFE** Increased many fold over those made with hydrogenated castor oil or hydroxystearic acid.
2. **ECONOMY THRU INCREASED YIELD** – Low initial raw material cost plus higher yield – considerably harder consistency at 77°F than with either hydrogenated castor oil or hydroxystearic acid.
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4. **EASE OF PREPARATION AT LOWER TEMPERATURE** Soap readily formed and more easily dispersed in mineral oil at 100°F lower temperature.
5. **IMPROVED APPEARANCE** Finished grease smoother in texture and more pleasing in appearance.
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Now available in car-load quantities from the world's largest producer of Castor Oil and Castor Oil Derivatives.

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Please send sample and property sheet:

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- ☐ 12-Hydroxystearic Acid

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Address_____

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IB-125

Francisco marketing division effective November 1, it was announced today by J. G. Jordan, marketing vice president, New York.

He replaces W. E. McDonald, San Francisco division manager since 1948, who will be on special assignment for Shell on the west coast until his retirement early next year.

Mr. Haight is a native of San Francisco and attended Stanford University. He joined Shell in 1928 as a service station attendant in San Francisco, and later served as salesman, fuel oil manager, division sales manager in Seattle and Spokane, retail sales manager in Sacramento, and assistant division manager in Los Angeles. From 1948 to 1951 Mr. Haight was sales manager of the San Francisco division and most recently has been assistant west coast sales manager.

Mr. McDonald joined Shell in 1933, serving as salesman, division sales manager, and Oakland division manager before moving to the San Francisco division managership.

OIIC Announces New Field Director

Appointment of John F. Campbell, of Chicago, as Field Director for the Oil Industry Information Committee of the American Petroleum Institute was announced by Executive Director H. B. Miller.

Campbell, heretofore Midwest Regional Director for the industry-wide public relations program, has also served as District Representative in the Boston and Chicago offices.

J. W. Lenon, Senior District Representative in the Kentucky-Ohio-Tennessee District Office in Cincinnati, has been appointed Campbell's successor in Chicago, as Midwest Regional Director. John Richardson, of the Cincinnati office, has been promoted to the Lenon vacancy.

Other changes in the field organization announced by the Executive Director are as follows:

H. S. Phillips, of the New York District Office, has been transferred to the Chicago office;

F. D. Rogers, Jr., has been added to the New York District Office staff;

C. D. Everhart, of the New Orleans office, has been promoted to the Philadelphia office, as Senior District Representative;

R. W. Fuehrer, of Canton, Ohio, has been added to the Philadelphia staff;

B. B. Thompson, of Denver, Colo., has been promoted to the Chicago office, as Senior District Representative;

A. C. Rose, of Tulsa, Okla., has been transferred to the New Orleans office;

Robert B. Bizal, of Tulsa, has been added to the Tulsa staff.

John H. Francis has been added to the Atlanta, Ga., staff;

Socony Mobil Oil Company Appoints Arthur M. Sherwood

Appointment of Arthur M. Sherwood as assistant secretary of Socony Mobil Oil Company, Inc., has been announced at the company's headquarters in New York. He had served as legal counsel since joining Socony Mobil in March 1954 and was previously associated with the law firm of Shearman & Sterling & Wright, New York.

Mr. Sherwood was graduated from Harvard University in 1936 and Columbia University School of Law in 1939. His five years of army service during World War II included 11 months of combat in Europe. He reached the rank of lieutenant colonel

and was awarded the Legion of Merit, Bronze Star, Croix de Guerra with Palm (France), Military Cross (Czechoslovakia) and five battle stars.

Mr. Sherwood was born in Portland, Ore. He lives with his wife and three children on Titus Mill Road, Pennington, N. J.

U. S. Steel Appoints Dr. Robert O'Connor Medical Director

Clifford F. Hood, president, United States Steel Corporation, announced the appointment of Dr. Robert B. O'Connor of Boston, Massachusetts, as medical director for United States Steel, effective January 1, 1956. Dr. O'Connor will succeed Dr. J. Huber Wagner, who will serve as chairman of a United States Steel medical advisory committee upon his retirement next January, after thirty-five years of outstanding service.

Dr. O'Connor has been assistant professor of industrial medicine at the Harvard School of Public Health. He has also been medical director of the loss prevention department of Liberty Mutual Insurance Companies and director of their company health service. A native of Boston and a graduate of Harvard Medical School, he has been a specialist in the field of industrial medicine for the past thirteen years.

During the past eight years he has been a consultant in industrial medicine for several hundred industrial and business concerns throughout the country. He thus brings to United States Steel a broad and varied experience in a wide range of industrial medical programs and problems.

As a teacher of a graduate course in industrial medicine at Harvard, Dr. O'Connor counts among his former students the medical directors of a number of industries here and abroad.

He is active in many associations and committees relating to medicine in industry. He is a member of the Industrial Medical Advisory Board of the National Fund for Medical Education, the Massachusetts division of the American Cancer Society, the American Association of Industrial Nurses, the President's committee on employing the handicapped, the Cambridge (Massachusetts) Community Council and the World Medical Association. He is a member of the committee on industrial health of the Massachusetts Medical Society, the National Association of Manufacturers, the American Medical Association, the Industrial Medical Association, the New England Industrial Medical Association, the American Public Health Association and the American Industrial Hygiene Association.

In making the announcement, Mr. Hood said today—"We recognize the importance of good health to all of us in United States Steel and to the continuing success of our company. Our developing program will be directed toward assisting all employees in improving and maintaining their health in cooperating with their family physicians."

AEC Chairman Strauss To Speak at Nuclear Engineering Science Congress

Admiral Lewis L. Strauss, Chairman of the United States Atomic Energy Commission, heads the list of speakers at the All-Congress Dinner of the Nuclear Engineering and Science Congress to be held in Cleveland, Wednesday, December 16, at the Statler Hotel.

Admiral Strauss will provide the keynote talk for the more than 2000 delegates to the Congress, the nucleus of which is the program of 300 technical papers on various aspects of progress toward the peaceful uses of the atom.

One of the high points of the week-long gathering, the All-Congress Dinner will be attended by business, industrial and political leaders, in addition to engineers and scientists in the nuclear fields.

Thorndike Saville, President of Engineers Joint Council and Dean of the College of Engineering, New York University, will make the welcoming address. Walker L. Cisler, President of Detroit Edison Company and Chairman of the Atomic Industrial Forum, Inc., will be toast-master, while Dr. John R. Dunning, Dean of the Columbia University School of Engineering, will introduce Admiral Strauss.

The Congress, coordinated by Engineers Joint Council, begins Monday, Dec. 12 and continues through Friday, Dec. 16. The Atomic Exposition, displaying the latest devices and materials for industry in the application of nuclear energy with nearly 150 exhibitors runs concurrently with the Congress in the Exhibition Hall of Cleveland's Public Auditorium. The Exposition, however, begins on Saturday, Dec. 10.

Chek-Chart Corp. Appoints Henry C. Fordtran

Ray Shaw, President of The Chek-Chart Corporation, Chicago, Ill., announces the appointment of Henry C. Fordtran to the post of Assistant to the President. Mr. Fordtran, a graduate of Northwestern University, has an extensive management background which includes a Vice-Presidential post with Wilson Jones Company and a Divisional Controllership with Montgomery Ward and Company, both of Chicago.

P. L. Berkman Joins Petroleum Institute Staff

Paul L. Berkman, a research associate at Columbia University's Bureau of Applied Social Research, has joined the staff of the Department of Information of the American Petroleum Institute.

Berkman will review and coordinate

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the various surveys undertaken by the Department and the Oil Industry Information Committee, as well as outside surveys pertinent to the Information Committee's functions. His studies and reports will help the Information Committee plan and implement its nation-wide public relations program.

During his three years with the Bureau of Applied Social Research, Berkman studied motivation factors involving people behind the Iron Curtain, in the Middle East, and in this country. During World War II, he was a lieutenant commander in the U. S. Navy. He is a graduate of Minnesota State Teachers College and of the National War College, and has done graduate work in the departments of sociology at the University of Chicago and Columbia University.

Socony Mobil Elects Board Member Dallas Lamont

Dallas R. Lamont has been elected to the board of directors of Socony Mobil Oil Company, Inc. Mr. Lamont, who has been patent counsel since 1931, will be in charge of the company's research and development program and of its laboratories.

William M. Holaday, who has headed Socony Mobil's research and development activities since 1944, has been appointed to a new position as coordinator, new product planning, and will report to Clark S. Teitsworth, director and vice president in charge of supply and distribution.

Mr. Holaday will have primary responsibility for coordinating the company's forward planning of product quality and will serve as chairman of an interdepartmental committee to be established to aid in carrying out this function.

Mr. Lamont, after serving as a private in the U. S. Army during World War I, was graduated from the University of Wisconsin in 1920, with a B.S. degree in electrical engineering. While an undergraduate he taught engineering mathematics at the university.

Mr. Lamont was admitted to practice before the U. S. Patent Office in 1922 and was admitted to the New York State Bar in 1924.

From 1920 to 1925 he was associated with the patent law firm of Pennie, Davis, Marvin, and Edmonds, in New York City.

In 1925 Mr. Lamont joined the Industrial Spray Drying Corporation, New York City. While in charge of the company's research and development and patent activities he invented bead soap, the forerunner of soap products widely marketed today. A patent for this product and its manufacture was issued to him in 1927.

Mr. Lamont was engaged in the private practice of patent law in New York City from 1929 until January 1, 1931, when he joined Socony as patent counsel.

Mr. Lamont, who is a native of Oregon, Wis., is 56 years old. He is a member of Tau Beta Pi, honorary engineering fraternity, and of Eta Kappa Nu, honorary electrical engineering fraternity.

With Mrs. Lamont he resides at 35 Park Ave., New York City.

Mr. Holaday joined Socony Mobil in 1937 as assistant general manager of the company's laboratories. He nad previously been a research engineer with the Standard Oil Company of Indiana.

On leave of absence during World War II he served as chief of the aviation section and later as assistant director of refining of the Petroleum Administration for War in Washington, D. C. He returned to Socony Mobil in 1944 as director of the company's laboratories.

Mr. Holaday is a member of the Society of Automotive Engineers, the Institute of Chemical Engineers, and the Industrial Research Institute, as well as a member of the Aircraft Fuels Subcommittee of the National Advisory Committee for Aeronautics. He is a member also of the Military Petroleum Advisory Board.

Born in New Vienna, Ohio, in 1901, he received his bachelor's degree in mechanical engineering from Ohio State University in 1925.

Married and the father of three children, he lives in Westfield, N. J.

Patents Developments

Continued from page 23

Mfg. Co., to be the only positive, self-priming plug valve lubricant gun on the market. It weighs 39 lb. and operates on pressures up to 150 psi. (Paper Trade J. 9/19/55 P. 40).

U.S. Patent 2,716,251 (Amy Pierce)—Grease applicator.

U.S. Patent 2,718,332 (Societe Tacalemit)—Lubricant compressor.

U.S. Patent 2,718,343 (Brown Grease Gun Co.)—Combination dispensing and siphoning nozzle and pumping means.

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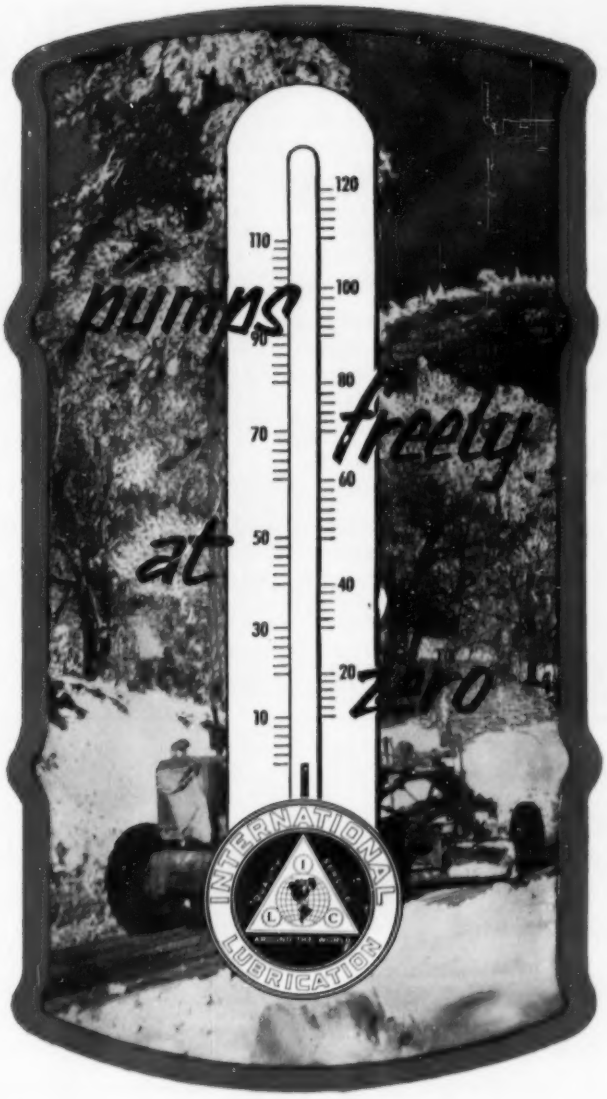

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FUTURE MEETINGS of the Industry

NOVEMBER, 1955

9-10 Society of Automotive Engineers (fuels and lubricants meeting), Bellevue-Stratford Hotel, Philadelphia, Pa.

13-18 American Society of Mechanical Engineers (75th anniversary meeting), Hilton & Blackstone Hotels, Chicago, Ill.

14-16 American Petroleum Credit Association, Carter Hotel, Cleveland, Ohio.

14-17 American Petroleum Institute (35th annual meeting), Mark Hopkins, Fairmont, St. Francis, and Palace Hotels, San Francisco, Calif.

14-18 Chicago Exposition of Power and Mechanical Engineering (ASME), Coliseum, Chicago, Ill.

16 American Petroleum Institute (OIIC Steering Committee meeting), San Francisco, Calif.

17 National Industrial Conference Board (general session), Bellevue-Stratford Hotel, Philadelphia, Pa.

18-22 National Safety Council and National Safety Congress and Exposition, Chicago, Ill.

20-21 Western Petroleum Refiners Association (regional technical and industrial relations meeting), Garrett Hotel, El Dorado, Ark.

27-30 American Institute of Chemical Engineers (annual meeting), Statler Hotel, Detroit, Mich.

30 Mid-Continent Oil & Gas Association (annual meeting, Board of Directors), Tulsa Club, Tulsa, Okla.

DECEMBER, 1955

1-3 American Chemical Society (Southwest meeting), Shamrock Hotel, Houston, Tex.

1-3 Interstate Oil Compact Commission, La Fonda Hotel, Santa Fe, N. M.

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EXACT FORMULATION — various formulas are tested until one is produced that meets all of manufacturer's requirements.

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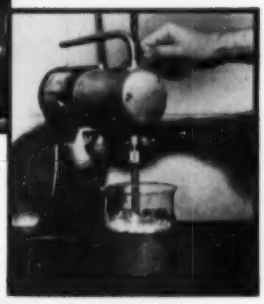
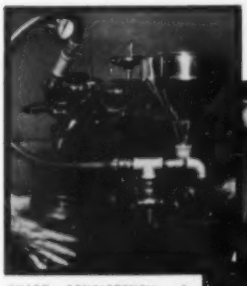
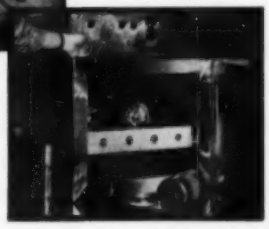


MILLING—milling or homogenizing produces a smooth, consistently uniform grease.



EXACT CONSISTENCY — penetrometer tests indicate consistency or hardness of grease sample and determine the plasticity of the formula.

EXCELLENT MECHANICAL STABILITY — roller tests measure mechanical stability of grease and produce a numerical evaluation — during penetration testing — of the change in consistency caused by kneading or working action of rollers.



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5-9 25th Exposition of Chemical Industries, Commercial Museum and Convention Hall, Philadelphia, Pa.

6-7 Petroleum Packaging Committee of Packaging Institute, Benjamin Franklin Hotel, Philadelphia, Pa.

8-9 American Petroleum Institute (OIIC meeting), Waldorf-Astoria Hotel, New York, N. Y.

11-14 American Society of Agricultural Engineers (Winter meeting), Edgewater Beach Hotel, Chicago, Ill.

JANUARY, 1956

9-13 SAE Annual Meeting, Sheraton-Cadillac Hotel and Hotel Statler, Detroit, Mich.

10-12 Kentucky Petroleum Marketers Assn. (30th annual meeting), Brown Hotel, Louisville, Ky.

25-26 Northwest Petroleum Association (annual convention), Nicollette Hotel, Minneapolis, Minn.

30 to
Feb. 3 American Institute of Electrical Engrs. (1956 Winter general), Statler Hotel, New York, N. Y.

FEBRUARY, 1956

22-23 Iowa Independent Oil Jobbers Association, Inc. (convention), Fort Des Moines Hotel, Des Moines, Ia.

MARCH, 1956

7-9 American Petroleum Institute (Division of Production, Southern District Meeting), Plaza Hotel, San Antonio, Tex.

12-16 National Assn. of Corrosion Engrs. (annual convention), Statler Hotel, New York, N.Y.

19-21 Western Petroleum Refiners Association (annual meeting), Plaza Hotel, San Antonio, Tex.

20-22 Ohio Petroleum Marketers Assn., Inc. (Spring Convention & Trade Exposition), Deshler-Hilton, Columbus, Ohio.

21-23 American Petroleum Institute (Division of Production, Southwestern District Meeting), Texas Hotel, Fort Worth, Tex.

APRIL, 1956

2-4 American Institute of Electrical Engrs. (Southwest District No. 7), Dallas, Texas.

16-20 Greater New York Safety Council (annual convention and exposition), Statler Hotel, New York, N. Y.

18-20 National Petroleum Association, Cleveland, Ohio

22-26 National Tank Truck Carriers, Inc., Shoreham Hotel, Washington, D. C.

30 to
May 1 Independent Petroleum Association of America (semiannual meeting), Statler Hotel, Los Angeles, Cal.

30 to
May 2 Chamber of Commerce of the United States (annual meeting), Washington, D. C.

30 to
May 4 American Petroleum Institute (safety and fire protection mid-year meeting), Warwick Hotel, Philadelphia, Pa.

JUNE, 1956

3-8 SAE Summer meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

17-22 ASTM 59th Annual Meeting and 12th Apparatus Exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J.

SEPTEMBER, 1956

7-8 Desk & Derrick Club, New Orleans, La.

12-14 National Petroleum Association, Atlantic City, N. J.

16-22 ASTM 2nd Pacific Area National Meeting and Apparatus Exhibit, Hotel Statler, Los Angeles, Calif.

OCTOBER, 1956

22-24 NLGI ANNUAL MEETING Edgewater Beach Hotel, Chicago, Ill.

NOVEMBER, 1956

1-2 SAE National Diesel Engine Meeting, Drake Hotel, Chicago, Ill.

8-9 SAE National Fuels and Lubricants Meeting, The Mayo, Tulsa, Okla.

APRIL, 1957

16-18 National Petroleum Association, Cleveland, Ohio

JUNE, 1957

16-21 American Society for Testing Materials, Chalfonte-Haddon Hall, Atlantic City, N. J.

SEPTEMBER, 1957

11-13 National Petroleum Association, Atlantic City, N. J.

OCTOBER, 1957

28-30 NLGI ANNUAL MEETING Edgewater Beach Hotel, Chicago, Ill.

APRIL, 1958

16-18 National Petroleum Association, Cleveland, Ohio

JUNE, 1958

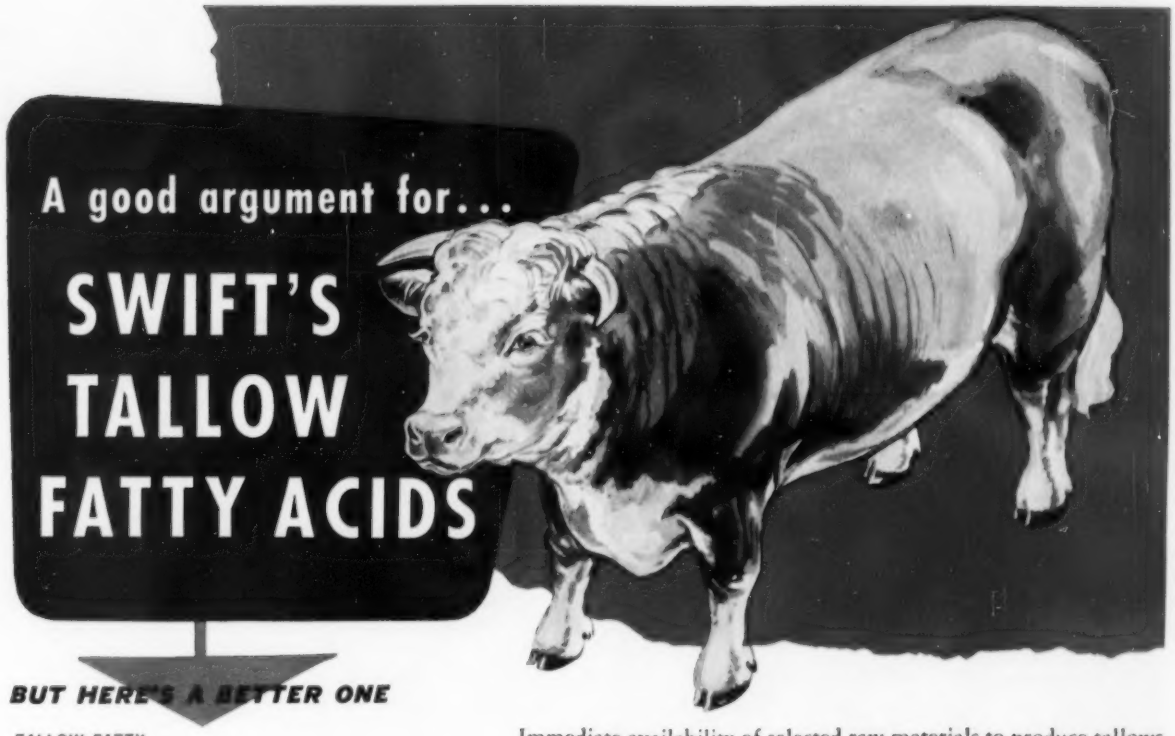
22-28 ASTM 61st Annual Meeting, Hotel Statler, Boston, Mass.

SEPTEMBER, 1958

10-12 National Petroleum Association, Atlantic City, N. J.

OCTOBER, 1958

27-29 NLGI ANNUAL MEETING Edgewater Beach Hotel, Chicago, Ill.



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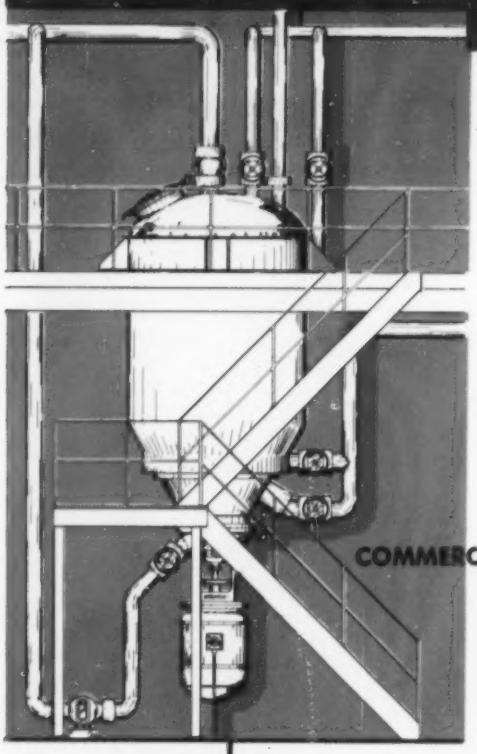

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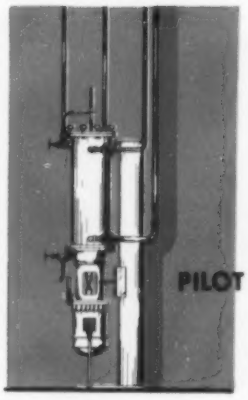

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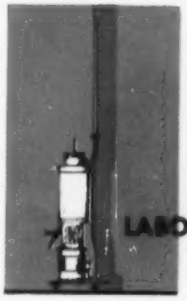

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